Dissolving Medical Waste

As environmental regulations stiffen and the costs of waste disposal continue to rise, industries are searching for alternatives to the traditional methods of waste disposal. American hospitals, which produce an average of 2 million tons of waste per year, according to the American Hospital Association (AHA), are among those reevaluating their waste disposal methods.

Concerns about the disposal process of infectious waste have increased with the spread of viruses such as HIV and hepatitis B. "When the public became aware of AIDS, it happened to be at the same time that medical waste began washing up on beaches," said Gary Urbanowicz, vice president of Doucet & Mainka, an environmental consulting and engineering firm in Peekskill, New York. This, along with impending regulations to reduce air pollution released by medical waste incineration, has prompted hospitals to explore alternative waste disposal methods.

According to the AHA, about 15% of hospital waste is classified as infectious and its disposal is regulated. Traditional methods of medical waste disposal include incineration and autoclaving, which involves sterilizing the waste at high temperatures before it is taken to a landfill. Infectious waste is regulated by the states because there are no federal regulations that specifically govern disposal of medical waste other than hazardous waste. Officials do not anticipate any federal involvement in medical waste regulation in the near future, other than medical waste incineration reform. "Medical waste regulations are already addressed on a state level adequately," Urbanowicz said.

Mounting Waste Regulations

However, waste regulations for all industries are continuing to rise at state and federal levels as waste disposal options diminish and environmental standards are strengthened. As the AHA pointed out in a book entitled *An Ounce of Prevention: Waste Reduction Strategies for Health Care Facilities*, "In short, end disposal options (landfills, incinerators, etc.) are becoming increasingly narrow. The pipeline of 'products in, wastes out' has now become a funnel with an ever narrowing outlet for waste."

As part of the 1990 Clean Air Act, the EPA has been working to draft emissions standards for all types of incinerators. Medical waste incinerator emissions standards will be released in July 1997, and will set limits for emissions of particulate matter, carbon monoxide, dioxins and furans, hydrogen chloride, sulfur dioxide, nitrogen oxides, lead, cadmium, and mercury, said Rick Copland, an environmental engineer in the EPA's Office of Air and Radiation in Research Triangle Park, North Carolina. Officials in the medical waste industry speculate that the new regulations will result in the shutdown of anywhere from 80% to 95% of the approximately 2,400 onsite hospital medical waste incinerators because the cost of adjusting the incinerators to meet the standards will be too high. Copland said that if the final standards are released as they have been proposed, the cost of medical waste incinerators could double or triple. "Once [the regulation] finally happens, you will see a large segment of onsite hospital medical waste incinerators shut down," said Rich Moskowitz, director of the Medical Waste Institute, an industry trade group that represents companies that manufacture waste treatment technologies and transport medical waste. "As hospitals choose new treatment methods, some will choose alternative technologies," he said.

Many states are setting goals and regulations mandating reductions in solid waste generation by the turn of the century. California, which has some of the strictest environmental regulations in the country, mandated a 25% reduction in landfill waste by the end of 1995 and a 50% reduction by the year 2000. Monetary penalties are being enforced for noncompliance. As a result, California hospitals have been among the first in the country to employ alternative methods of waste disposal.

Reducing the amount of products used by hospitals is not a likely option, as most hospitals prefer to use disposable products. About 90% of hospitals now use one-use disposable gowns and sterile drapes because of their potential to be infectious after use. "The disposables trend started in the 1950s, blossomed in the 1960s, and it's been growing ever since," Urbanowicz said. "There's been some interest in going back to reusable products, but for now [hospitals] continue to rely heavily on disposables." Therefore, focusing on alterna-

tives to the disposal of waste is the key to reducing costs and environmental impact.

Disposable Alternatives

In the wake of this search by hospitals for alternative waste disposal methods, the Isolyser Corporation has introduced new disposable healthcare products that it claims are more cost-effective, safer, and more environmentally friendly than traditional products.

Isolyser, based in Norcross, Georgia, has developed what it calls a "Bio-Cycle" approach to manufacturing healthcare products, which involves creating products from natural compounds that can be degraded back into natural compounds after use. The goal of the company is to provide a way for hospitals to minimize waste, which benefits the hospitals by reducing disposal costs and benefits the environment. To do this, the company has developed a material called OREX, which is used to make products that perform like traditional disposables, but can be dissolved in water after use, rather than being deposited in a landfill or incinerated.

OREX is made from hot-water-soluble polyvinyl alcohol (PVA), a nontoxic synthetic polymer. PVA is currently used as a component of many commercial products including adhesives, binding agents, paper, ceramics, emulsifiers, fabric, and pharmaceuticals. OREX is used to make such products as surgical gowns, towels, patient drapes, sponges, bowls, basins, and diapers.

After the OREX products are used, they are placed into an onsite processing unit, similar to a commercial washing machine, where they are disinfected and dissolved in water heated to about 200°F for approximately 45 minutes. A large-sized machine can hold up to 100 pounds of materials and requires between 50 and 100 gallons of water to dissolve a large load. An Isolyser study, entitled *Disinfection Using the OREX Degradables Processor*, found that a temperature of 190°F disinfects OREX products contaminated with vegetative forms of bacteria, fungi, mycobacteria, and viruses. The leftover liquid residue is safe enough to be sent directly into the sewage system, where the polymer is further degraded by microorganisms.

PVA has been found to degrade rapidly, usually within the first 24 hours in a sewage treatment facility using acclimated sludge organisms, according to an Isolyser report, *Biodegradation of Polyvinyl Alcohol in Sewage Treatment Facilities*. Twenty different genera of bacteria and several molds and yeasts have been found to degrade PVA. The report concluded that PVA is totally biodegradable in sewage treatment facilities and the final products of degraded PVA are carbon dioxide and water. The leftover sludge containing OREX by-products is chemical-free and safe for agricultural use.

According to Isolyser, PVA is environmentally safe and has been found to be nontoxic and nonhazardous to humans and aquatic organisms in studies conducted by the company on rabbits, rats, mice, bluegill, fathead minnows, water fleas, and bacteria.

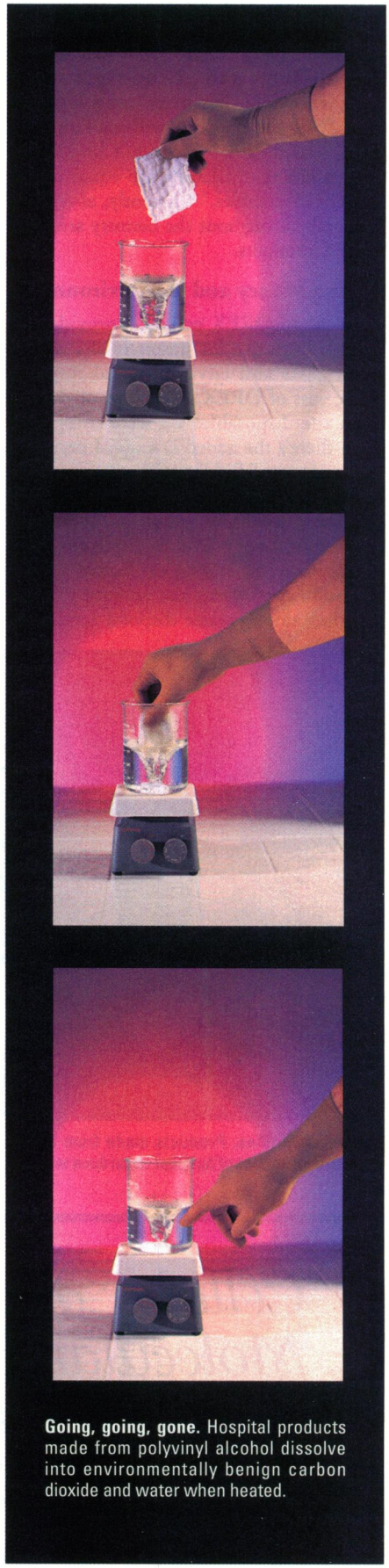
Customer Satisfaction

So far, reaction to the products has been positive. Public health officials in California tested the products because of concerns with water recycling, but after thorough testing, OREX was approved for use in California. "We feel that the OREX method is safe and offers another alternative to the treatment of medical waste," said Vernon Reichard, supervisor of the medical waste management program for the Environmental Management Branch of the California Department of Health Services. "This is a unique method; it's the only one that we've reviewed and approved that actually dissolves into a liquid and can be sewered."

Several hospitals in California are currently using OREX. "So far, the wastewater treatment plants are very satisfied that it's not creating a problem," said Jack McGurk, chief of the Environmental Management Branch of the California Department of Health Services. McGurk said California public health officials are impressed with OREX, particularly the benefits of quality control and quality assurance. "If the water is not hot enough, [the material] doesn't dissolve. OREX provides good visual quality assurance that it's working correctly," he said.

Queen of the Valley Hospital (QVH) in Napa Valley, California, has been using OREX products since March of this year. The hospital is currently using all the products that are available, including gowns, nurses' caps, physicians' hoods, drapes, and towels. The hospital will use other products, such as scrub clothes and basins, as soon as they are available. "I've seen the basins and I'm very impressed with them," said Mary Fiddler, manager of surgical services, the post-anesthesia care unit, anesthesia, and central processing for QVH. "We plan on using everything they have out." So far, the products have proven to be durable and the staff at QVH has been very satisfied with them, Fiddler said.

Anaheim Memorial Hospital, in Anaheim, California, is conducting a trial



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Going, going, gone. Hospital products made from polyvinyl alcohol dissolve into environmentally benign carbon dioxide and water when heated.

period with the products, says Tracy Balen, a public relations specialist for the hospital. The operating room staff is using the products and giving feedback to Isolyser, which has been cooperative in modifying the products and sending them back, Balen said. "We won't implement the products until they are equal to our current disposables." Currently, about 400 hospitals throughout the country are using OREX products.

Saving Money and the Environment

The use of OREX products provides the double incentive for hospitals of reducing both costs and environmental impacts. "The cost of OREX is equal to or cheaper than the disposables we were using, and then there's the added savings of decreased disposal costs," Fiddler said.

According to the Medical Waste Institute, hospitals spend an average of $.19 to $.30 per pound to dispose of infectious waste, depending on factors such as the volume of waste, the amount of competition among waste disposal services in the area, and energy costs. The disposal process for OREX products costs about $.03 per pound, including water and electricity costs, according to Isolyser. Isolyser estimates that hospitals can save 5–15% of total spending on disposables by using OREX.

Because the products are safe for sewage disposal, they pose no water quality threat, and subsequently divert waste away from landfills and incinerators, thus reducing pollution. "OREX products present a cutting edge opportunity to help decrease the volume of medical waste," Urbanowicz said. According to Travis Honeycutt, executive vice president of Isolyser and inventor of OREX, approximately 10–15% of all hospital waste could be eliminated by the use of OREX, including virtually all infectious waste. "The biggest advantage is that we don't have mountains of solid waste [with OREX]," Honeycutt said.

Honeycutt says he was driven to develop the products by environmental concerns. "My partner and I (Robert Taylor) recognized that what we call disposables are really discardables; they lay around and won't go away," he said. "Everything is biodegradable; it just matters where you put it."

So far, the products have received little criticism. However, they are still new to the market and lack thorough reviews. "We want to review the process after it's been in use for a while to see if it holds up to the expectations surrounding it. We feel it probably will, but you never know," Reichard said.

Isolyser is optimistic about the future of OREX. The new EPA emissions standards to be released next year could positively affect OREX sales as hospitals search for alternatives to incineration, Honeycutt said. "When fully utilized by hospitals, 50 to 70% of all regulated medical waste from disposable products coming out of the hospitals could ultimately be made out of OREX," said Ted DuBose, president of SafeWaste Corporation, a subsidiary of Isolyser.

In the immediate future, Isolyser plans to continue developing other hospital supplies. According to Honeycutt, OREX also has the potential for use beyond infectious and hazardous waste, and Isolyser plans to eventually market to industrial, consumer, and international corporations. "We are very excited about the potential for OREX. It's a product and an idea whose time has come," Honeycutt said.

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Truly disposables. Products made from OREX may significantly reduce the amount of hospital hazardous waste.

Suggested Reading

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